Psychological Aspects of Sport-Injury Rehabilitation: A Developmental Perspective

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Twenty years ago, a sports medicine colleague invited me to give a presentation at the annual meeting of the National Athletic Trainers’ Association held in Newport Beach, CA. He specifically asked me to speak on the “psychology of the injured athlete” because athletic trainers were clamoring for more information about the elusive mental issues facing individuals recovering from injury and returning fully to competition. Although I was unfamiliar with the literature on the psychological aspects of sport injury, the opportunity to return to one of my favorite places and the challenge of pulling together a scholarly article on a new topic were intriguing enough for me to enthusiastically say “yes” to the invitation. However, when I got organized to do my usual exhaustive library search for relevant articles to guide me, I came up with little more than a few descriptive articles on the injury-prone athlete and personality types that may predispose individuals to injury. I scrambled to pull together an article that would be “true” to the psychological literature and practical for athletic trainers working with injured athletes. I settled upon approaching the topic using the psychological stress model, couching injury as a stressor and delving into the cognitive, emotional, and behavioral consequences of injury.¹

That was then. Today, 20 years later, the theoretical and empirical knowledge base on psychological issues related to athletic injury is considerably more substantive, sophisticated, and definitive.²⁻⁵ Moreover, this research reveals information about successful interventions that are likely to make a difference in participants’ healthy return to sport involvement. It is both fortunate and satisfying to see how far “psychology of the injured athlete” has come from conceptual, empirical, and applied perspectives. Still, given the volume and severity of injuries that occur in any given year, the quest for continued knowledge about maximizing injured athletes’ mental recovery and hastening their return to a physically active lifestyle is a work in progress.

One of the sorely neglected areas in athletic-injury psychology is age-related differences in antecedents and consequences of injury.⁵ Most of the researchers to date have investigated injury factors in collegiate athletes or young adult recreational participants. We know from developmental sport psychology that children, adolescents, and young, middle, and older adults differ in their self-perceptions, social influences, emotional responses, motivations, and self-regulation skills relative to physical activity and sport involvement.⁶ It is only reasonable to extrapolate, then, that such individual differences and social-environmental influences are also salient when considering factors related to athletic-injury rehabilitation. I congratulate the authors of the articles in this section for tackling issues related to adolescent sport-injury rehabilitation. These articles are a good start in forging deeper into age-related factors in the psychology of injury. I agree with Brewer⁷ when he says, “I hope that this collection of articles will serve as a springboard for further developmental inquiry on psychological aspects of sport injury . . . .” To help stimulate further developmental inquiry, I will (1) briefly overview what it means to take a developmental perspective, (2) highlight desirable common themes among the articles, and (3) offer recommendations for future empirical inquiry on developmental athletic-injury psychology.

What Is a Developmental Perspective?

Many of you have worked with children through older adults in sport and rehabilitation settings. No doubt, you have observed considerable differences between children and adolescents in their cognitive ability to understand exercise prescriptions and their motivation to persist with these regimens. Similarly, the transition from adolescence to adulthood brings with it a number of changes in self-perceptions (eg, self-esteem), emotional responses (eg, sources of stress), and motivational orientations (eg, intrinsic versus extrinsic reasons for undertaking an activity). Progression from young adulthood to middle and older adulthood evokes salient issues related to health, independence, and other quality-of-life indicators. Thus, a developmental perspective means that we must consider variations in and interrelationships among thoughts, emotions, and behaviors at various periods across the life span.

A developmental researcher seeks to describe and explain psychological and behavioral changes within individuals across the life span as well as differences and similarities in the nature of these changes among individuals.⁸ These issues may be approached by following the same individuals longitudinally to determine quantitative and qualitative change over time in constructs of interest (eg, emotions, self-perceptions). Alternatively, these questions can be answered by deliberately selecting and then comparing age groups at key periods of development (ie, cognitive, physical). Developmental sport psychologists emphasize using theories, designs, and methods that capture age-related differences in cognitions, perceptions, and behaviors in physical activity contexts.⁹ Being able to describe and explain the course of development in a particular psychological
construct provides researchers and practitioners with information for developing interventions that are age appropriate and effective for evoking behavioral change (eg, healthy rehabilitation from injury and return to participation).

**Common Themes**

Although each of the articles in this section revolves around the topic of athletic-injury psychology among adolescents and adults, they tackle a number of different issues (ie, readiness for surgery, responses immediately after surgery, predictors of rehabilitation adherence, frequency of intrusive thoughts and avoidance behavior). Thus, I will comment on the “collective” by identifying what I perceive to be desirable or positive features related to research design, sampling procedures, and measurement and statistical issues.

**Research Design.** One desirable study-design characteristic is testing or developing theory. Using conceptual frameworks such as the psychological readiness for change model (Udry et al10) and biopsychosocial model of injury rehabilitation (Brewer et al11) is especially helpful because theory provides practitioners with general principles or rules about relationships among variables that enlighten our ability to choose appropriate interventions. If studies are designed on the basis of theoretical models relevant to sport injury and rehabilitation, the knowledge base is systematically advanced and effective applications are conceived. For example, Udry et al10 found that certain processes of change differentiated adolescent from adult patients undergoing anterior cruciate ligament surgery. Sports medicine personnel might consider these specific strategies when working with individuals of varying ages. Brewer et al11 found that athletic identity was important in explaining adolescents’, but not adults’, adherence to rehabilitation. These results suggest that a unidimensional self-identity may be a motivating factor in rehabilitation among teenage athletes. Wiese-Bjornstal5 recommended the models of preinjury vulnerability12 and postinjury response13 as organizing frameworks upon which to design developmental studies.

A second issue in research design is selecting salient variables for inclusion in developmental research. A number of individual difference and social-environmental variables are appropriate to include in studies of developmental sport-injury psychology. Specific cognitive, emotional, social, and behavioral constructs that are important to adolescents are self-perceptions (eg, identity, self-efficacy), social support (by parents, coaches, and peers), emotional responses (eg, anxiety, mood, depression, stress), motivations (eg, intrinsic motivation, self-motivation), and competence (eg, rehabilitation adherence). One readily sees that all the studies used one or several of these personal or social factors. Wiese-Bjornstal,5 in her exhaustive review of developmental factors relevant to athletic injury, also highlighted perfectionism, risk taking, perceived competence, life stressors, and coping resources as noteworthy personal variables for children and adolescents. Social-environmental variables that should be considered include socialization (ie, “sport ethic” to play with pain and injury), modeling by older and professional athletes, family dynamics, social vulnerability (eg, negative coaching), and training intensity.

A third research-design characteristic is the use of appropriate control groups. Controls are essential to accurately conclude that developmental differences exist. Controls might include appropriate comparison groups, homogeneity of injury type, and drawing samples from the same sports medicine clinic. The authors of the articles in this section did a nice job of comparing younger and older injured athletes and healthy and injured age cohorts. Most of the studies focused upon anterior cruciate ligament injuries so as to not confound findings with other types of injury or injury severity, and most drew participants from the same sports medicine clinic. In sum, studies that carry the most potential for informing us of developmental differences in sport-injury vulnerability and response are those that stem from a sound conceptual framework, include developmentally appropriate variables, and use control groups to definitively state age-related conclusions.

**Sampling Procedures.** Developmental studies may be designed by (1) selecting ages of participants on the basis of specific developmental criteria (cognitive, physical), (2) comparing age groups at key periods of development (cognitive, physical), or (3) following individuals longitudinally on constructs of interest.8 Sample selection is an area in which developmental sport injury research may be improved in the future. Each of the studies included adolescents; however, they ranged from 15–19, 16–18, 14–19, and 13–18 years of age. Developmental differences may exist between early and later adolescents, a topic I will return to later.

The age ranges for adult participants were considerably more variable. The comparative adult sample of Udry et al10 was 30 to 48 years, the range of Tripp et al14 was 20 to 53 years, and the adults in the study of Brewer et al11 spanned 20 to 47 years. Just as adolescents may differ from young adults in perceptions, attitudes, and beliefs, so too may young and middle-aged adults. I liked the protocol of Udry et al10 for ensuring distinct age differences in the selection of adults who were 1 SD older than the mean age of the sample, resulting in a comparison of 15- to 19- versus 30- to 48-year-olds. By contrast, the 18-year-old participants in the study of Tripp et al14 may not be developmentally different from the 20-year-old participants. Brewer et al,11 using moderated regression analysis, was able to contrast 18-, 26-, and 34-year-olds on variables that enlighten our ability to choose appropriate interventions. If studies are designed on the basis of theoretical models relevant to sport injury and rehabilitation, the knowledge base is systematically advanced and effective applications are conceived. For example, Udry et al10 found that certain processes of change differentiated adolescent from adult patients undergoing anterior cruciate ligament surgery. Sports medicine personnel might consider these specific strategies when working with individuals of varying ages. Brewer et al11 found that athletic identity was important in explaining adolescents’, but not adults’, adherence to rehabilitation. These results suggest that a unidimensional self-identity may be a motivating factor in rehabilitation among teenage athletes. Wiese-Bjornstal5 recommended the models of preinjury vulnerability12 and postinjury response13 as organizing frameworks upon which to design developmental studies.

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Another sampling issue encountered in the present studies was competitive level or years-of-experience differences. In the sport domain, age, competitive level, and years of experience are potential confounds. That is, as children get older, they tend to participate at higher competitive levels and accumulate more expertise through experience. In the various samples, considerable variability existed in sport status (competitive, recreational athletes), number of hours per week invested in sport activities, and primary reason for undergoing surgery (return to sport, return to daily activities). Thus, a potential alternative explanation for age-related findings in these studies is differences in competitive level, years of experience, or some combination of age, competitive level, and years of experience.

**Measurement and Statistical Issues.** Developmentally appropriate measures are essential in studies designed to tease out age-related differences. Instruments that may have been validated with adult samples are not necessarily valid with younger
samples because developmental differences may exist in the structure and content of constructs.\textsuperscript{15,16} The researchers used multiple, diversified assessments to get at various cognitive, emotional, and behavioral constructs central to the question at hand. The authors were thorough in reporting scale reliabilities for their study samples, but it was not always clear whether the measures were developed and validated with adolescents.

Statistical issues also arise with developmental studies. Between–age-group differences may exist, but often within–age-group variability (ie, SD) is so large that statistically significant age differences are cancelled out. By contrast, age differences may emerge as statistically different, but the practical or clinical significance of these differences may be slight. Both these situations may result in misleading or inaccurate conclusions. Therefore, it is important to go beyond inferential statistics and calculate effect sizes that provide an index of meaningfulness of the findings. For example, Udry et al\textsuperscript{10} not only reported statistically significant age differences but also an effect size indicating that 42\% of the variance in mood disturbance and processes of change was attributable to age-group differences. In contrast, Tripp et al\textsuperscript{14} reported nonsignificant differences between adolescents and adults on depression, which may have occurred because of the small sample size and large within–age-group variabilities. I calculated an effect size by subtracting the means of both groups and dividing by the SD of the adult group,\textsuperscript{17} resulting in a value of 0.46, or a moderate effect. Similarly, the statistically significant effect for pain catastrophizing was associated with an effect size of 0.50. Thus, depression and catastrophizing were both moderately important for differentiating injured adolescent and adult athletes when considering clinical and not only statistical significance.

Recommendations for Future Developmental Inquiry

My previous discussion implicated research design, sample selection, and measurement and statistical issues for conducting developmental studies of injury rehabilitation. In this last section, I extend my commentary and outline considerations and recommendations revolving around alternative research designs, age-appropriate measures, age-by-gender considerations, and adolescent period differences.

Alternative Research Designs. Characteristic of many athletic-injury psychology studies is a limited sample size, large within-group variability in constructs, or both. Large within-group age variability is also a signature of developmental studies in general. Limitations of sample size and heterogeneous variability often translate to nonsignificant statistical differences between age groups. Thus, researchers might consider using alternative study designs in future research. First, a within-subject design with several assessments taken on constructs of interest allows researchers to follow change over time for each participant, and fewer participants are needed to establish adequate power to find significant differences. A second alternative would be to use a profiling approach, given that considerable individual differences emerge in athletic-injury studies. For example, injured athletes could be individually profiled on sources and types of social support. This may be especially insightful in comparing child and collegiate athletes; parents and peers are likely to be key sources for children, whereas teammates and coaches may be more reliable sources for intercollegiate competitors. A good template for individual profiling is the work of Harter\textsuperscript{18} examining self-perceptions across the lifespan (see Horn\textsuperscript{16} for application to the physical domain).

Age-Appropriate Measures. One of the most difficult issues in conducting developmental research is accessing and developing instruments that are psychometrically valid for a particular age group. Despite this dilemma, we need to go beyond simply revising wording on items or creating fewer response options for younger populations to ensure that questionnaires are valid on the basis of the cognitive developmental level of the participant. Researchers often need to do additional preliminary work to ensure such validity, develop and validate their own measures, or explore measures in the developmental psychology literature, where researchers are often engaged in psychometric developments for validating age-appropriate instruments.

Age-by-Gender Considerations. In each of the 4 studies, samples consisted of about equal numbers of female and male adolescents. However, gender was not taken into account in the analyses or explanations of the findings. Does gender matter in developmental sport-injury research? In developmental sport psychology, male and female children are more similar than different on such constructs as self-perceptions, motivational orientations, and social influences.\textsuperscript{16,19} However, during adolescence, gender differences emerge on a number of cognitive, emotional, social, and behavioral variables. For example, Horn\textsuperscript{16} pointed out that in the transition from middle to senior high school, gender differences are evident in global self-esteem, with girls reporting lower self-esteem than boys. These self-esteem differences are attributed primarily to variations in perceptions of physical appearance. Girls show a decline in perceived physical appearance and a concomitant increase in the importance placed on appearance; their dissatisfaction with physical appearance also increases during this time frame. Certainly, physical appearance perceptions and self-esteem may be critical issues in injury response and rehabilitation. Moreover, Wiese-Bjornstal\textsuperscript{5} noted that gender differences exist in activity levels, injury rates, risk-taking behavior, perceived vulnerability, rating of injury severity, and parents’ reactions to risk taking during the adolescent period. Collectively, these data suggest that gender should be considered along with age in developmental sport-injury studies that include adolescents and adults.

Adolescent Time-Period Differences. All adolescents are not created equal—considerable differences have been identified during early/middle adolescence (ages 12–15 years) and later adolescence (ages 16–18 years). For example, early and middle adolescents rely upon parents and classmates as significant sources of social support and physical competence information; later adolescents are more likely to use self-referenced sources (eg, self-improvement) of physical competence information and peers (peer group, close friends, teammates) as social support.\textsuperscript{16} Moreover, frequent fluctuations occur during the time period when they are 12–15 years old, including physical changes, cognitive-maturational changes, increased sensitivity to others’ evaluations, and the social environment in which teenagers reside (school, family, athletic climate). Therefore, in future developmental sport-injury studies, researchers might be attentive to differences between adolescent time periods as well as gender differences within early/middle and later adolescence.
CONCLUSIONS

Children and adolescents have rarely been studied in sport-injury psychology research. Given the magnitude and severity of injuries each year in younger populations, it is imperative that more developmental research be conducted. The 4 data-based studies in this section represent an outstanding start to building the developmental sport-injury knowledge base. However, much more needs to be done. Future researchers should carefully consider research design, sampling procedures, measurement and statistical issues, age-by-gender interactions, and adolescent time-period differences in their studies related to sport-injury psychology.

REFERENCES


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